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ABSTRACT

This study examined the effects of a unique form of team competition involving competition among individuals and teams on a variety of classroom group processes. A 3 x 2 (treatment x teacher) design was employed using intact high school social studies classes over a 12-week period. When compared to individual competitions, the team competition resulted in widespread positive effects on variables such as student peer-tutoring, normative climate, students' friendship circles, and mutual concern experienced among the students. Varying the mechanism for calculating team scores created little change in the effects on classroom group processes. This study suggests that team competition placing students in face-to-face competition at the individual and team levels results in positive effects on many classroom processes. (A 37-item bibliography, 8 diagrams, 7 tables, and 2 appendixes are included.) (Author)

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TEAM COMPETITION EFFECTS ON CLASSROOM GROUP PROCESS

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Introductory Statement

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through three programs to achieve its objectives. The Schools and Maturity program is studying the effects of school, family, and peer group experiences on the development of attitudes consistent with psychosocial maturity. The objectives are to formulate, assess, and research important educational goals other than traditional academic achievement. The School Organization program is currently concerned with authority-control structures, task structures, reward systems, and peer group processes in schools. The Careers program (formerly Careers and Curricula) bases its work upon a theory of career development. It has developed a self-administered vocational guidance device and a self-directed career program to promote vocational development and to foster satisfying curricular decisions for high school, college, and adult populations.

This report, prepared by the School Organization program, examines how a team competition type of classroom reward structure affects the extent and quality of the students' interpersonal relationships.

Acknowledgments

The authors are indebted to the invaluable contributions of the following individuals: Marie L. Cain and Ann DeGiovanni for creative implementation in their classrooms; Frank Brown for assistance in finding a setting within which to conduct the experiment; John P. Snyder for his assistance with the data analysis, James McPartland and John Hollifield for their critical readings of earlier drafts, and Ann Forthuber for typing of several drafts.

INTRODUCTION

Purposes

Classroom reward structure refers to the way in which students are required to meet performance standards in order to receive some presumably reinforcing or valued consequence (Michaels, 1974). The traditional classroom reward structure is a form of individual competition in which students are rewarded according to how their performances compare to those of their classmates (or some larger population). The deleterious effects of the traditional reward structure on classroom group processes (that is, the extent and quality of interpersonal relationships in the class) have been noted repeatedly (Waller, 1932; Deutsch, 1949; Coleman, 1959; Johnson & Johnson, 1974).

Group competition is a classroom reward structure often proposed as a constructive alternative to traditional individual competition (Bronfenbrenner, 1970; Spilerman, 1971). Under group competition, groups receive rewards according to how their group performance compares to that of other groups. All members of a group typically receive the same proportion of the total team reward (that is, if the group gets an A, each member of the group gets an A). Several empirical comparisons of group (or team) competition with individual competition in classrooms strongly suggest that group competition has positive effects on such classroom processes as

peer helping, coordinating, intragroup liking, and peer influence (Deutsch, 1949; Hammond and Goldman, 1961; Witte, 1972).

The usual group competition treatment has involved within-group cooperation on a group task (frequently a group report) and across-group competition with rewards contingent on the performance of the group task. Deutsch (1949) and others have emphasized the importance of the group cooperative task in creating the favorable group processes. The present study examines whether a form of team competition (entitled TGT) which pairs individual competition across teams with interteam competition can create similar widespread and positive effects.

Teams-Games-Tournament (DeVries & Edwards, 1973; DeVries, et al., 1973) is an instructional technique that systematically restructures the classroom reward and task structures. TGT can be briefly described as follows. Students are assigned, on a stratified random basis, to four-member, heterogeneous (on task ability) teams. Team members regularly (at least weekly) compete individually within ability levels as representatives of their teams. The competition occurs in groups of three with the task being a type of instructional game. Because the students at any given game table are of comparable ability, each student has an approximate probability of .33 of winning on any trial. Team scores are calculated by summing (or averaging) the scores of the individual teammates. The team scores are ranked and reported in frequent classroom newsletters. Within team interaction occurs primarily at instructional pregame practice sessions. For the actual performance session each teammate works at a separate game table.

This unique combination of individual and team competition (TGT) has proved to be more effective in teaching game-specific academic skills (Edwards, et al., 1972; Edwards & DeVries, 1972; Edwards & DeVries, 1974) than the traditional individual competition structure. The issue this study addresses is whether this particular form of team competition also has the same widespread facilitative effects on classroom group processes as team competition which employs group tasks (Deutsch, 1949).

A second issue concerns the effect of using different strategies to calculate team scores. Hamblin, et al. (1971) conducted a study in which the traditional group scoring formula (all team members' scores are given equal weight) was contrasted with a "low performance" formula (team score is the average score of the bottom three performers on the team). The low performance group score treatment produced greater overall academic achievement than the traditional group score treatment, but their differential effects on classroom group process were not examined. The question of how weighting teammates' performances affects group processes is an important one and is addressed in the present study.

Classroom Group Processes

Classroom group processes are defined by the extent and quality of interpersonal relationships among students in the classroom. This study examines four types of classroom group processes formed by two dichotomous dimensions. The first, derived from the Bales & Strodtbeck (1951) schema, contrasts task vs. social emotional. The second dimension contrasts behaviors with expectations. The resulting four types of classroom group processes are task area-behavior; task area-expectation, social emotional-behavior, and social emotional-expectation. Classroom group process

behaviors refer to such interpersonal actions as peer-tutoring or sharing a joke. Classroom group process expectations deal explicitly with normative climate variables as general expectations among the students concerning the importance of surpassing others on the academic tasks. The four types of classroom group process variables are likely to be differentially affected by the reward structure variables manipulated in the present study, and vary in importance as preconditions for academic achievement in the classroom.

METHOD

Subjects

The subjects were 191 students attending a suburban high school. Sixty-four percent were tenth graders, twenty-six percent were eleventh graders, and ten percent were twelfth graders. Black students represented seven percent of the sample, and 47% were males. The study used six intact American History classes. Tests of the initial comparability of the six classes were conducted for several variables, and all tests failed to disprove the null hypothesis: Social Studies Achievement ($F = 1.47$; $df = 5,187$), English Achievement ($F < 1$, $df = 5,170$), Father's Education ($F < 1$, $df = 5,187$), and Educational Aspirations ($F < 1$, $df = 5,187$).

Design

The study was conducted for a twelve-week period and used a 3 X 2 (Treatment-by-Teacher) nonequivalent control group design (Campbell & Stanley, 1966). The three levels of the treatment factor were Individual Competition (IC), Team Competition with team Average (TCA) and Team Competition with team Weighting (TCW). For the teacher factor, two

different classroom arrangements were used. Teacher #1 had large classes (45-50 students per class), was assisted by a junior teacher, and had special arrangements for small group interaction. Teacher #2 had classes, ranging in size from 25-30 students, and taught in a traditional classroom. All teachers were females.

Treatments

All three treatment groups met for 55-minute periods daily throughout the experimental period. The textbook and primary source materials used were held constant across treatment conditions. The current paper sketches the parameters of the three treatment groups. A more elaborate description is available in DeVries, et al., (1974).

Individual Competition (IC): The IC students followed this weekly schedule: Every Monday each student was handed a list of ten questions, six of which would be asked on that Friday during a quiz. Every Tuesday and Friday a portion of the period (between 20 and 40 minutes) was allotted to unstructured practice sessions. During this time each student was expected to prepare (by consulting the textbook and primary sources) for the upcoming quiz. Students were allowed to work either by themselves or with others. The remainder of the time on Monday through Thursday involved class level instructional activities, primarily teacher lectures.

On each Friday quiz, the students individually answered six of the ten questions assigned to them on Monday. The subset of six was selected randomly by the teacher, and the subset was held constant across the three experimental conditions. Before each quiz the teacher exhorted the students to do well, and reminded them that they would have to out-perform

their classmates to receive a high score because she was grading "on the curve." On the Monday following each quiz, each student had his paper returned with a letter grade at the top. The grade was calculated using his classmates' performance as the criterion. Each student was told that his weekly quiz score would count toward his semester grade.

Team Competition-Average (TCA): The weekly schedule of the TCA treatment was similar to that used in Individual Competition. At the beginning of the experiment students were assigned, on a stratified-random basis, to a five or six-member team. The teams were stratified on both prior social studies achievement (using three levels) and sex (each team had from two-to-four females). The team composition remained the same during the entire twelve-week period. During the first day of the experiment the students were told (1) they would be assigned to teams, (2) their team's score would count heavily on their course grade and (3) their team would compete against the other teams for high grades.

Each Friday's tournament proceeded as follows: each student was assigned to a six-person tournament table, with each person at the table representing a different team.[1] Every participant randomly selected one of the ten questions assigned earlier in the week. After a five-minute preparation period, each participant was given the opportunity to answer the

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[1] The tournament structure employed in the current TGT tournament differs in two ways from that used earlier by the authors (DeVries & Edwards, 1973; DeVries, et al., 1973). The competition at the tournament tables in the current study did not involve competition among students of comparable ability levels. Secondly, because of the complexity of the required answers in the tournament, reference to a single answer sheet was not allowed, rather a group of three competitors were required to make independent judgments of the adequacy of each person's answer.

question he selected. Three of his competitors at the table rated his response on a six-point scale. After every participant at the table had the opportunity to answer, the individual scores were calculated by taking the average of the ratings given by the three peers.

The team scores were announced to the students on the following Monday through bulletin board notices, handouts, and teacher announcements. Team scores were calculated by averaging the individual teammates' scores. Team scores were then ranked, with particular notice being paid to which teams were in the top slots and to which teams were moving rapidly up or down in the rankings. Teams received letter grades based on their ranking. The teams were compared on both a "weekly" and "season record" basis. Each team was also provided with a sheet listing both the weekly and season record scores of each teammate.

Team Competition-Weighted (TCW): This treatment condition differed in only one aspect from the TCA treatment--calculating team scores. The TCW condition weighted the scores of the low performing teammates more heavily. Figure 1 contains an example of the weighted scoring system.

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Insert Figure 1
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As indicated in the Figure, each teammate's raw score was multiplied by the rank of his score to form a composite score. The composite scores were summed and divided by the number of teammates to form the team score.

The importance of the low performers in determining the team score is illustrated in Figure 1. The bottom three performers in this case contributed 80% of the total team points. For the TCA condition these same performers would have contributed only 55% of the points.

Dependent Variables

The dependent variables were derived from three measurement sources: observation of student classroom behavior, a student self-report of classroom processes, and a sociometric questionnaire. The finding of consistent treatment effects across the three forms of measurement would handle, at least in part, the inevitable problem of large measurement error with any given measure.

Observation of Student Behavior: Student behavior was observed using the Student Behavior Scale (SBS) during the relatively unstructured practice periods and resulted in an estimate of the level of peer task behavior. The SBS was developed by the authors and evidence exists concerning its validity and reliability (DeVries & Edwards, 1973). Clerical assistants, trained in the use of the SBS, observed a 50% randomly chosen sample of students in each class. Each class was observed three times during the final four weeks of the experiment. The SBS codes behavior into one of six cells: Peer-Task, Peer-Nontask, Teacher-Task, Teacher-Nontask, Individual-Task, and Individual-Nontask. The peer-task variable was formed by taking the total number of peer-task behaviors observed in a treatment group across the three observation periods.

Student Description/Classroom Process: The second source of measurement is derived from the Learning Environment Inventory (LEI). The LEI is a multidimensional self-report measure of classroom process which employs fourteen distinct scales. Each scale consists of five to seven statements to which a student responds on a four-point Likert-type scale. The LEI has evidenced considerable reliability and validity (Walberg and Anderson, 1968, 1972; Anderson, 1970; Anderson, Walberg and Welch, 1969).

Three LEI-type scales were employed: Perceived Competition, Perceived Classmates Expectations, and Perceived Mutual Concern. Appendix A contains the specific items included under each scale. The internal consistency estimates (using coefficient alpha) calculated for each scale are as follows: Competition = .74; Classmate Expectations = .79; Mutual Concern = .63. Both midtests (6 weeks into the study) and posttests of the three scales were administered to all students. Although pretests were desired, the authors followed the recommendation of various authors of classroom processes instruments (Steele, et al., 1971) that such measures not be administered until at least several weeks of the school year had passed.

Sociometric Data: Both task and social-emotional types of relationships among students were measured by five sociometric items: (1) Friends in school (2) Friends out of school (3) Would go to for help (4) Have helped you, and (5) You have helped. An alphabetical list of classmates was provided for each item. The students were instructed to check the names of as many students as they felt appropriate. The sociometric questionnaire was administered both on a pretest and posttest basis.

The percent of agreement across students provides one estimate of the validity of the sociometric items. That is, if student A selected student B as a friend in school, it is reasonable to expect that student B would also select student A. A random selection of classes (both experimental and control) revealed the following levels of agreement: Friends in school =61%; Friends out of school = 51%; Would go to for help = 49%; You helped/helped you = 56% agreement. For every student percentage scores were calculated for each of four of the five sociometric items (the helped you dimension was omitted because of its redundancy with you helped). Each percentage score was formed by dividing the number of selections made by the total number of classmates. Arc-sine transformations of the percentage scores were carried out, as suggested by Alder and Roessler (1968).

The sociometric items also provided data for comparing group process effects between the TCA and TCW conditions. For these comparisons team scores were formed on the following variables: Team Friendship Ratio, Team Helping Ratio, and Team Task Orientation. The Team Friendship Ratio was defined by the number of within-team choices made by the team members on the friends-in-school item over the total number of possible within-team friendship choices. The Team Helping Ratio consisted of the number of within-team choices on the "you helped" item over the total number of possible within-team helping choices. The Team Task Orientation was defined by the number of within-team "you helped" selections divided by the number of within-team "friends in school" selections.

Analyses

The three sets of dependent variables required two analytical strategies. The data from the SBS consist of general frequencies of two types of behavior (peer-task behavior vs. the other five SBS categories of behavior) at the classroom level. For this dependent variable Goodman's Multivariate Analysis of Qualitative Data (Goodman, 1969, 1970) was used.

The data for the remaining dependent variables were analyzed using the general linear model approach to the analysis of variance recommended by Cohen (1968). The advantage of using this technique over traditional ANOVA analysis is two-fold. First, more readily available regression analysis computer programs can be used to perform most of the calculations. Second, terms representing specific interactions between various trait variables and the treatment variables can be included directly in the analysis (Tobias, 1973).

For the dependent variables on which pretest data were collected, the pretest score was entered into the model as the trait measure. In general, the variables were ordered as follows: pretest score, teacher factor, treatment factor, the three two-way interaction terms (defined by product terms, as suggested by Cohen [1968]), and the three-way interaction term. The teacher and treatment factors were coded as dummy variables (Kerlinger, 1973).[1] The general ordering of the terms follows the procedure

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[1] The dummy variables for the Teacher factor were assigned as follows: Teacher 1 = -1; Teacher 2 = +1. The Treatment factor involved two dummy variable comparisons. The first contrasted the IC group with the two Team Competition conditions (IC = -2; TCA = +1; TCW = +1). The second contrasted the two TGT variations (IC = 0; TCA = -1; TCW = +1).

described by Overall and Spiegel (1969) as method 3, in which an a priori ordering of all terms is used. For each term in the model the incremental R^2 (R_I^2) is calculated and tested for significance. As noted by Walberg (1971), R_I^2 provides a direct estimate of the variance in the dependent variable accounted for by the particular independent variable, above and beyond that explained by variables previously entered into the model.

RESULTS

Table 1 contains a summary of the results. The dependent variables are classified into those analyzed at the individual level and those analyzed at the team level. The four types of group process variables are contained in the individual level analysis. Listed for each variable is the level of significance of the observed Treatment effect, Teacher effect, and Teacher-by-Treatment interaction effect. If a significant Treatment effect was observed, the ranks of the three treatment conditions are listed in the final three columns. The table indicates widespread treatment main effects as well as treatment-by-teacher interaction effects.

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Insert Table 1
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For all Treatment main effects, the Team Competition conditions produced higher levels on the variable of interest. Few systematic differences between the two team competition conditions were observed. A more detailed presentation of the results follows. The results are presented in order by the particular form of measurement used.

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Insert Figure 2
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Observation of Student Behavior: The peer-task variable was analyzed using Goodman's Multivariate Analysis of Qualitative Data. The analysis revealed significant Teacher ($Z = 3.35$, $P < .01$, two-tailed test), Treatment ($Z = 6.91$, $P < .01$), and Teacher-by-Treatment interaction ($Z = -2.51$, $P < .05$) effects. The peer-task percentage scores (number of peer-task behaviors divided by total number of observations) for each of the six classes involved are depicted in Figure 2. As the Figure indicates, the TCA condition created the most peer-task behavior, the TCW condition the next most, and the IC condition resulted in the least. The Treatment effect, however, must be interpreted in light of the significant interaction effect; that is, Teacher One's TCA and TCW classes account primarily for the main effect.

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Insert Tables 2 and 3 and Figure 3
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Student Report/Classroom Processes: Table 2 contains the results of the regression analysis for the three self-report measures--Competition, Classmates' Expectations, and Mutual Concern. Each of these scales can range from 5 to 20, with 12.5 being the neutral point. The table presents the R^2_I and F-Ratio for both the midtest and posttest measurements. Table 3 contains the Teacher-by-Treatment cell means for each of the three measures.

For the Competition scale midtest, significant Treatment ($P < .01$) and Teacher-by-Treatment interaction ($P < .05$) terms were detected. The Treatment effect was the larger of the two, explaining 9% of the variance in the dependent variable. For the posttest analysis, only a significant ($P < .05$) Teacher-by-Treatment interaction was observed. The specific nature of the

significant main and interaction effects can be determined from Table 3, which indicates that both the midtest and posttest interaction effects are due to a relatively high level of perceived competition created in Teacher Two's TCA class.

For the Classmates' Expectations variable a significant teacher effect ($P < .01$) was detected for the midtest, but the effect disappeared by posttest time. Table 3 suggests that the Teacher effect was due to greater Classmates' Expectations scale scores for Teacher Two's subjects. A significant Treatment effect ($P < .01$) was also obtained for both midtest and posttest, with the effect accounting for 33% of the variance for midtest scores. The treatment main effect, as shown in Figure 3, indicates substantially higher levels of Classmates' Expectations for both TCA and TCW than for IC.

Mutual Concern was significantly ($P < .05$) affected by Teacher at the midtest (Teacher Two > Teacher One), and by Treatment at both the midtest and posttest ($P < .01$). As the treatment group means in Table 3 indicate, both Team Competition treatments created greater Mutual Concern than the IC condition. In addition, the significant ($P < .01$) Teacher-by-Treatment interaction for both midtest and posttest suggest that Treatment main effect is due primarily to Teacher Two's classes.

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Insert Table 4 and Figures 4-6
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Sociometric Data: The analyses of the four sociometric variables (using arc-sine transformations of percentages) are summarized in Table 4.

Significant ($P < .01$) treatment main effects were noted for three of the four variables; these are depicted in Figures 4 through 6. Figure 4 indicates that the positive treatment effect for % of classmates considered as friends in school is due almost completely to the large increase for TCA subjects, who registered a dramatic increase from pretest to posttest. Figure 5 indicates a positive Treatment effect on the % of classmates a student would go to for help, with the Team Competition subjects reporting twice as many selections at the posttest than at the pretest. Figure 6 clarifies the positive Treatment effect for the % of classmates the subjects reported helping. As the Figure suggests, both Team Competition conditions account for the positive Treatment effect.

Significant Teacher main effects were detected (Table 4) for two of the four sociometric variables. For both variables (friends in school and you have helped) Teacher 2 created greater increases in posttest percentage scores (over that of pretest) than did Teacher 1 (See Table 3). Although the vast majority of the two- and three-way interaction effects proved nonsignificant, two significant Teacher-by-Treatment terms (for friends in and out of school) are of interest. In both cases Teacher 2 created a larger positive Team Competition effect than did Teacher 1.

In short, Team Competition created a wider friendship circle in the classroom and increased the percentage of classmates that students would go to for help, as well as the percent they actually did help. The Team Competition effect on expanding the student's friendship circle was due primarily to Teacher Two.

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Insert Table 5 and Figure 7
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Team Analysis--TCA vs. TCW: The sociometric data were also analyzed at the team level to investigate possible differential effects of TCA and TCW on team process. Table 5 summarizes the analyses for the Team Friendship Ratio and the Team Helping Ratio. Because both dependent variables consisted of percentage scores, arc-sine transformations of the raw data were conducted. The analyses revealed a significant ($P < .05$) Treatment main effect for the Team Helping variable, but not for the Team Friendship variable. The Treatment effect for Team Helping is depicted in Figure 7. The Figure shows that although both treatment groups reported little within-team helping on the pretest (TCA = 3%, TCW = 6%), a large proportion of teammates were reported as being helpful at the posttest time, particularly for the TCW condition (58% for TCW vs. 38% for TCA).

The third team-level variable, Team Task Orientation, was defined by the number of teammates selected as being helped divided by the number of teammates selected as friends in school. The larger the ratio, the more a team could be described as Task oriented. The regression analysis indicated a significant Treatment effect only ($R^2_I = .21$; $F = 5.38$; $df = 1,17$; $P < .05$).[1] The posttest treatment group means (TCA = .78; TCW = 1.12) reveal greater task orientation in the TCW teams.

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[1] The pretest data were omitted from the analysis because of instability of the scores, caused by low numbers of friendship and helping selections at the pretest.

DISCUSSION

The results of this study indicate a strong effect of team competition on classroom social processes. Introducing team competition structured around an instructional game created (1) greater peer tutoring, (2) a normative climate more supportive of academic achievement, (3) wider friendship circles for students in the classroom, and (4) greater concern among students for each other. The effects on interpersonal relations and normative climate support the several theories of group competition in the classroom (Deutsch, 1949; Coleman, 1959; Spilerman, 1971).

The test of the differential effects of unweighted vs. weighted group performance scores on classroom social process yielded less clear results. Using weighted scoring of teammates' performances appeared to create more task-oriented groups--groups in which fewer friendships were formed--than using unweighted scoring. That significant Treatment-by-Teacher interaction effects were detected for four of the nine process variables for which a significant treatment effect was also noted clouds the picture somewhat. However, a clear pattern in the significant interaction effects can be observed, with Teacher #2 consistently creating a greater treatment effect across the several variables.

Team Competition: Effects on Process

The positive effects of team competition on both Task Area-Behavior process variables (Peer-Task and % of classmates you helped) confirm results of earlier work on group contingencies conducted by the authors (DeVries & Edwards, 1973), and others (Deutsch, 1949; Wodarski, et al., 1971; Hamblin, et al., 1971; Witte, 1972). Of the behaviors observed during the

unstructured practice period, only 4% observed in the control classes were peer-task, whereas approximately 30% of the behaviors in the group competition classes fell into that category. By simply creating a level of reward interdependence among students on a team and providing an opportunity for students to work together, a strong increase in level of peer-task and peer-tutoring behavior was effected.

Of interest in interpreting the increased peer-task behavior in the team competition conditions is the role of the within-team interdependence. More specifically, if the reward interdependence created among teammates caused the effect, the behaviors should be directed primarily at teammates. An examination of the percent of choices represented by teammates for each of the four sociometric questions is contained in Table 6. The table lists

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Insert Table 6
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percent scores derived from the number of within-team choices over number of all choices. Both pre- and posttest measures are listed for both of the team competition conditions. The "You Helped" variable is of particular interest. On this variable, 35% of the posttest choices in the TCA condition were within-team, and 41% of the choices in the TCW combination were within-team.[1] In short, in both team competition treatments a majority of the students being helped were students on competing teams. The results suggest that inter-team competition, although a possible factor in creating cohesive teams, did not result in intense inter-team rivalry, but rather allowed for peer-tutoring across team lines.

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[1] It should be noted that such selection is substantially greater than what would be expected by chance. If the selection were made randomly, approximately 14% of the choices by TCA and TCW students would have been teammates.

The observed effects of team competition on the Task Area-Expectation process variables were also anticipated. Several studies have found that the normative peer climate is more oriented toward academic involvement, and peer encouragement for achievement is stronger, under group competition than under individual competition (Deutsch, 1949; Spilerman, 1971; DeVries, et al., 1971). The effect in the present study was particularly strong, raising peer norms from slightly negative to a definite positive reinforcement of academic achievement. Of interest also is the increased access of other students to provide assistance where needed (% of classmates would go to for help). Table 6 shows that, of these choices in the team competition classes, 27% in the TCA condition were teammates and 34% in the TCW condition were teammates. Thus, the students involved in the team competition treatments were under increased pressure to perform well on the task at hand, but this was combined with an extension of possible helpmates, an extension which even reached across team borders.

Although competition among students, particularly in the weekly tournament, is an integral part of the team competition treatment as implemented in the present study, only a temporary (at eight weeks into the treatment) effect on perceived competition was noted. The absolute level of competition in the team competition conditions was located at the midpoint of the scale (see Table 3). Consequently, the midtest Treatment main effect should be interpreted within the context of creating at most a neutral response to the competition dimension in the team competition classes. It would be interesting to discover why the students in the team competition classes, engaged in weekly intense face-to-face competitive encounters, did not experience the class as particularly competitive, but actually appeared to use the situation to help other students and be helped by them.

The basis for predicting team competition effects on social-emotional-behavior group process is slightly less direct than for the task oriented process variables. Deutsch (1949) in his theory of cooperative groups does predict a "positive cathexis" effect, in which if the actions of one member in a cooperative group move the group toward its goal, the other members will evaluate him and his actions favorably. The positive cathexis effect would appear to be moderated by the relative success of the team, and for unsuccessful teams a "negative cathexis" might well be predicted. The observed effect of team competition on the social-emotional relationships of the students (as measured by number of classmates listed as friends in or out of school) is limited, with only the number of friends in school positively affected.

Of interest in interpreting the team competition effect on number of classmates considered friends is assessing what percentage of these nominations represented teammates. Table 6 reveals that 24% of the posttest choices in the TCA condition were teammates, and 27% of the choices in TCW were teammates. In short, the broadened friendship circle created by team competition was accounted for primarily by contacts outside the team. That the team would not be the source of a major set of new friends for the participants was dictated in part by the uniquely heterogeneous group composition of each team. Each team was designed to be a "microcosm" of the entire class, consisting of high, middle, and low achieving male and female students. With the natural proclivity of individuals to select friends similar to themselves, it is understandable why the teams did not provide a setting for forming intense new friendships.

The effects of team competition on social emotional-expectations process variables was strong and in the expected direction. In an earlier study of team competition the authors observed a significant increase in perceived mutual concern among the students (DeVries & Edwards, 1973). The results also support the work of Deutsch (1958, 1960, 1962) with groups in which a higher level of interpersonal trust and concern was evidenced in cooperative groups than in strictly competitive settings. That students in the team competition classes perceived greater mutual concern among their classmates may well be due to the increased peer tutoring behavior they observed in the classroom.

Treatment-by-Teacher Interaction Effects

Significant Treatment-by-Teacher interaction effects were observed for four of the nine process variables for which a significant treatment effect was detected. Teacher Two created a larger treatment effect on three of these four variables, while Teacher One created a greater treatment effect for the observation measure of student peer-task behavior.

Three possible sources of the strong interaction effects suggest themselves: (1) background or personality characteristics of the teachers, (2) intensity of implementation of the team competition treatment, and (3) classroom structural features. With respect to teacher personality or background characteristics, Teacher One had greater teaching experience, particularly with the use of student teams, and consequently reported feeling more comfortable with the technique. As to intensity of implementation, the team competition treatment consisted of a series of highly controlled instructional variations including weekly tournaments, twice a week practice sessions, and weekly feedback sessions. These instructional variations were highly controlled and held constant across teachers.

The third possible set of explanatory concepts consist of classroom structural variables, such as class size, which might limit the effectiveness of team competition. Teacher Two had significantly fewer students (average of 25) than did Teacher One (average of 50). Class size dictates the number of teams in competition: in a classroom with 25 students, five different five-member teams can be formed, whereas in a 50 member class, ten different five-member teams are formed. The competition is doubled in the larger class, thus reducing the chance of team success. Such reduced probability of success may well affect the salience of the team competition for the students. Whether class size moderates the effectiveness of team competition is an important unresolved question that requires further investigation.

Team Competition Average vs. Team Competition Weighted

The analysis of differential effects of the two team competition treatments was carried out at two levels. The first level consisted of comparisons of individual behavior and expectations of subjects in both treatment conditions. For these analyses the results indicate remarkably few differences in process between the two conditions. For only two variables was a difference detected--TCA subjects exhibited more peer-task behavior and named more classmates as friends in school.

In the analyses of the team level variables, two of the three team variables revealed significant differences between TCA and TCW. TCW created (1) more widespread helping within the team, and (2) teams with greater task orientation.

The finding of more widespread helping in the TCW team competition is somewhat surprising. It was expected that assigning greater weight to the low performers would direct the helping more towards such students. A test of that hypothesis was conducted by selecting the two members of each team who consistently performed the worst. The variable of interest is the number of teammates such low performers reported being helped by. The results of the multiple regression analysis conducted are listed in Table 7. The analysis revealed a significant ($P < .01$) Treatment effect only, with the effect accounting for 31% of the variance. Figure 8

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Insert Table 7 and Figure 8
- - - - - - - - - - - - - - -

depicts the Treatment effect, with the TCW low performers reporting being helped by an average of 2.7 teammates, whereas the low performers in the TCA condition report being helped by only 1.0 teammates. The results indicate clearly that the weighted team competition (1) created greater overall helping of teammates, and (2) focused the helping on those teammates who needed help the most.

A question of interest is whether the increased reliance of the entire team on the low performers in the TCW condition may have strained the relationships between the low performers and their teammates. The number of teammates who cited low performers as friends in school was calculated for each low performer to determine whether low performers in the TCW condition were cited less often than their counterparts in the TCA condition. A multiple regression analysis (see Table 7) revealed no significant treatment main effects. The low performers in the TCW condition did not appear to be particularly alienated from their higher ability teammates.

Implications for Theory of Group Competition

The results of the current study support the contention of several advocates of group competition (Deutsch, 1949; Coleman, 1959; Bronfenbrenner, 1970; Spilerman, 1971) that forming reward interdependence among members of a group alters peer group norms, creates greater helping relationships, and improves the affective tone of their relationships. Two unanticipated results also deserve attention: First, the increased helping and friendship relationships observed in the team competition classes typically involved individuals representing competing teams, which was unexpected and counters the prediction of the primacy of the team made by Deutsch (1949). Second, the observed effect of more task-oriented team interaction due to weighting of teammates' performance cannot be deduced from any of the major theories of group competition. One explanation worth investigating may be that the weighting acts as a counterforce to a possible "getting lost in the crowd" effect.

REFERENCES

Alder, H.L. & Roessler, E.B. Introduction to probability and statistics. San Francisco: W. H. Freeman, 1968.

Anderson, G. J. The Learning Environment Inventory Manual. Center for Learning and Development, McGill University, Montreal, Canada. 1969.

Anderson, G. J. Effects of classroom social climate on individual learning. American Educational Research Journal, 1970, 7, 135-152.

Anderson, G. J., Walberg, H. J., & Welch, W. W. Curriculum effects on the social climate of learning. A new representation of discriminant functions. American Educational Research Journal, 1969, 6, 315-328.

Bales, R. F. & Strodtheck, F. L. Phases in group problem solving. Journal of Abnormal and Social Psychology, 1951, 46, 485-495.

Bronfenbrenner, U. Two Worlds of Childhood. New York, Russell Sage Foundation 1970.

Campbell, D. T. & Stanley, J. C. Experimental and Quasi-Experimental Designs for Research. Chicago, Rand McNally & Co., 1966.

Cohen, J. Multiple regression as a general data-analytic system. Psychological Bulletin, 1968, 70, 426-443.

Coleman, J. S. Academic achievement and the structure of competition. Harvard Educational Review, 1959, 29, 339-351.

Deutsch, M. An experimental study of the effects of co-operation and competition upon group process. Human Relations, 1949, 2, 199-231.

Deutsch, M. Trust and suspicion. Journal of Conflict Resolution, 1958, 2, 265-279.

Deutsch, M. The effect of motivational orientation upon trust and suspicion. Human Relations, 1960, 13, 123-139.

Deutsch, M. Cooperation and trust: Some theoretical notes. In M. R. Jones (ed) Nebraska Symposium on Motivation. Lincoln Nebraska: University of Nebraska Press, 1962, 275-320.

DeVries, D. L., Muse, D. & Wells, E. H. The effects on students of working in cooperative groups: an exploratory study. (Center Report No. 120) Center for Social Organization of Schools, The Johns Hopkins University, 1971.

DeVries, D. L. & Edwards, K. J. Learning games and student teams: Their effects on classroom process. American Educational Research Journal, 1973, 10, 307-318.

DeVries, D. L., Edwards, K. J. & Fennessey, G. M. Using Teams-Games-Tournament (TGT) in the Classroom. Center for Social Organization of Schools, The Johns Hopkins University, Baltimore, Maryland. 1973.

DeVries, D. L., Edwards, K. J. & Wells, E. H. Teams-Games-Tournament in the social studies classroom: Effects on academic achievement, student attitudes, cognitive beliefs and classroom climate. Center for Social Organization of Schools, The Johns Hopkins University, 1974.

Edwards, K. J., DeVries, D. L. & Snyder, J. P. Games and teams: A winning combination. Simulation and Games, 1972, 3, 247-269.

Edwards, K. J. & DeVries, D. L. Learning Games and Student Teams: Their effects on student attitudes and achievement. (Center Report No. 147). Center for Social Organization of Schools, The Johns Hopkins University, 1972.

Edwards, K. J. & DeVries, D. L. The Effects of Teams-Games-Tournament and two structural variations on classroom process, student attitudes, and student achievement. (Center Report No. 172). Center for Social Organization of Schools, The Johns Hopkins University, 1974.

Goodman, L. A. How to ransack social mobility tables and other kinds of cross classification tables. American Journal of Sociology, 1969, 75, 1-40.

Goodman, L. A. The multivariate analysis of qualitative data: Interactions among multiple classifications. Journal of the American Statistical Association, 1970, 226-256.

Hammond, L. & Goldman, M. Competition and non-competition and its relationship to group productivity. Sociometery, 1961, 24, 46-60.

Hamblin, R. L., Hathaway, C. & Wodarski, J. Group contingencies, peer tutoring and accelerating academic achievement. Paper presented at Conference on Operant Conditioning, University of Kansas, Lawrence, Kansas. Summer, 1971.

Johnson, D. W. & Johnson, R. T. Instructional goal structure: Cooperative, competitive, or individualistic. Review of Educational Research, 1974, 44, in press.

Kerlinger, F. Foundations of Behavioral Research. 2nd ed. Holt Reinhart Winston, 1973.

Michaels, J. W. A review and analysis of individual and group reinforcement and competition classroom reward structures. Center for Social Organization of Schools, The Johns Hopkins University. 1974.

Overall, J. E. & Spiegel, D. K. Concerning least squares analysis of experimental data. Psychological Bulletin; 1969, 72, 311-322.

Spilerman, S. Raising academic motivation in lower class adolescents: A convergence of two research traditions. Sociology of Education. 1971, 44, 103-118.

Steele, J. M., House, E. R. & Kervins, T. An instrument for assessing instructional climate through low-inference student judgments. American Educational Research Journal, 1971, 8, 447-466.

Tobias, S. Sequence, familiarity, and attribute by treatment interactions in programmed instruction. Journal of Educational Psychology, 1973, 64, 133-144.

Walberg, H. J. Generalized Regression Model in Educational Research. American Research Journal, 1971, 8, 71-91.

Walberg, H. J. & Anderson, G. J. Classroom climate and individual learning. Journal of Educational Psychology, 1968, 56, 414-419.

Walberg, H. J. & Anderson, G. J. Properties of the achieving urban class. Journal of Educational Psychology, 1972, 63, 381-385.

Waller, W. The Sociology of Teaching. New York: Wiley, 1932.

Witte, P. H. The effects of group reward structure on interracial acceptance, peer tutoring and academic performance. Unpublished Ph.D. dissertation, Washington University, 1972.

Wodarski, J. S., Hamblin, R. L., Buckholdt, D. & Ferritor, D. Effects of individual and group contingencies on arithmetic performance. Paper presented at the meeting of The American Educational Research Association, New York. January, 1971.

Teammate	Raw Score	Rank	Composite
A	7	1	7
B	6.5	2	13
C	6	3	18
D	5.5	4	22
E	5	5	25

Team score = 8 5/5 = 17

Figure 1: An Example of the Low Performance Weighted Team Scoring System

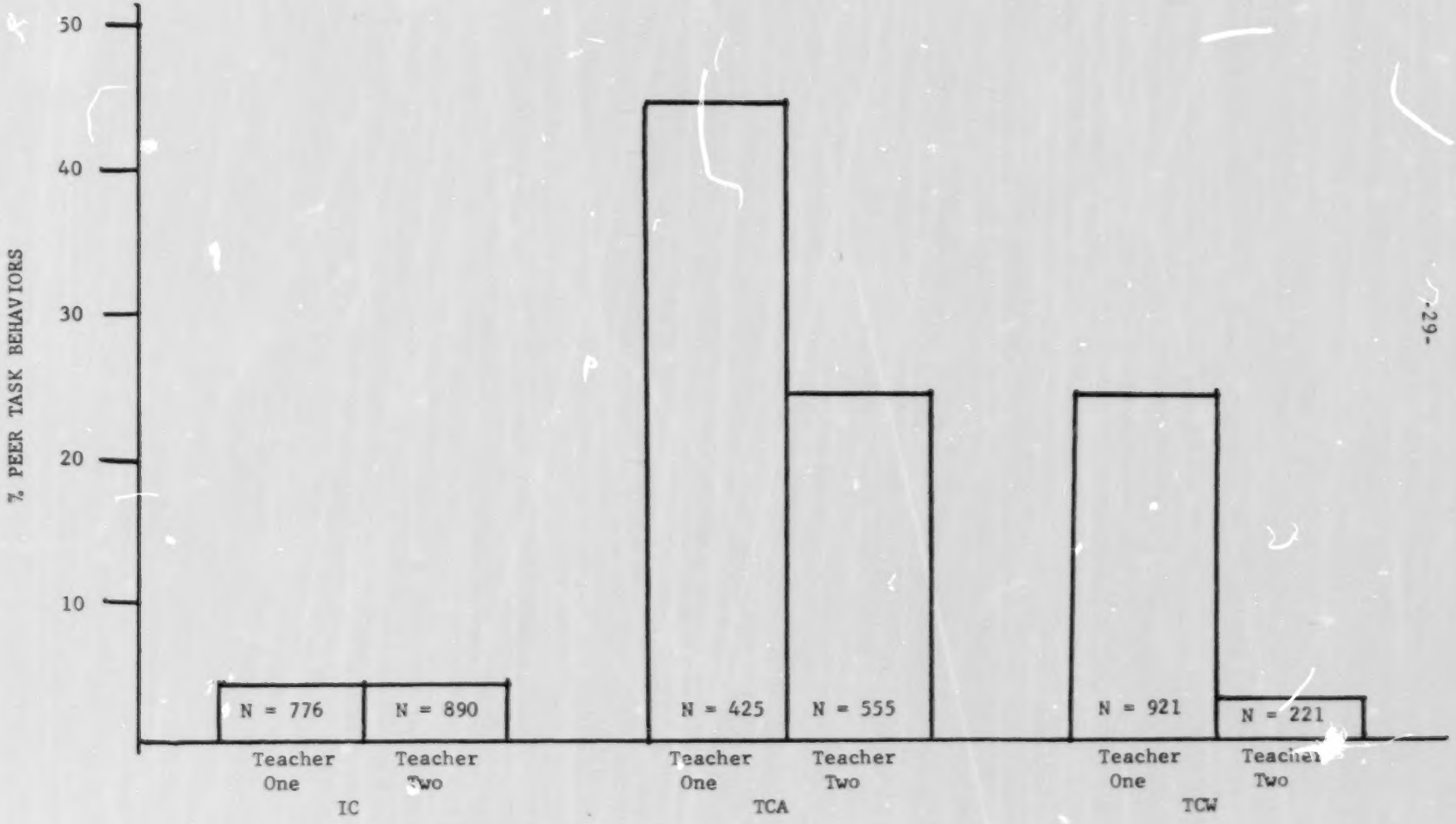

Figure 2: Treatment Group Means for Peer Task Behavior

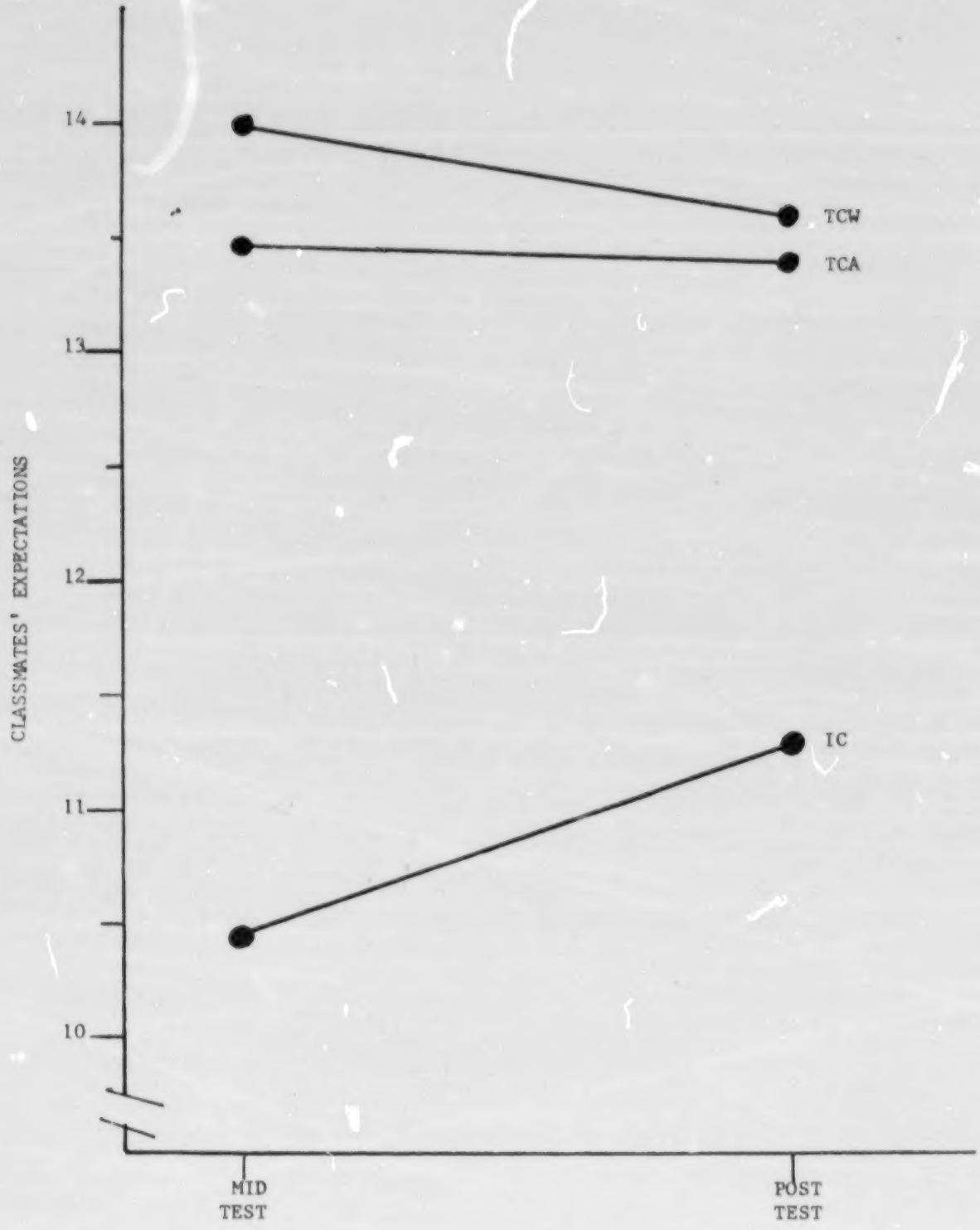

Figure 3: Classmate Expectations for Different Treatment Groups

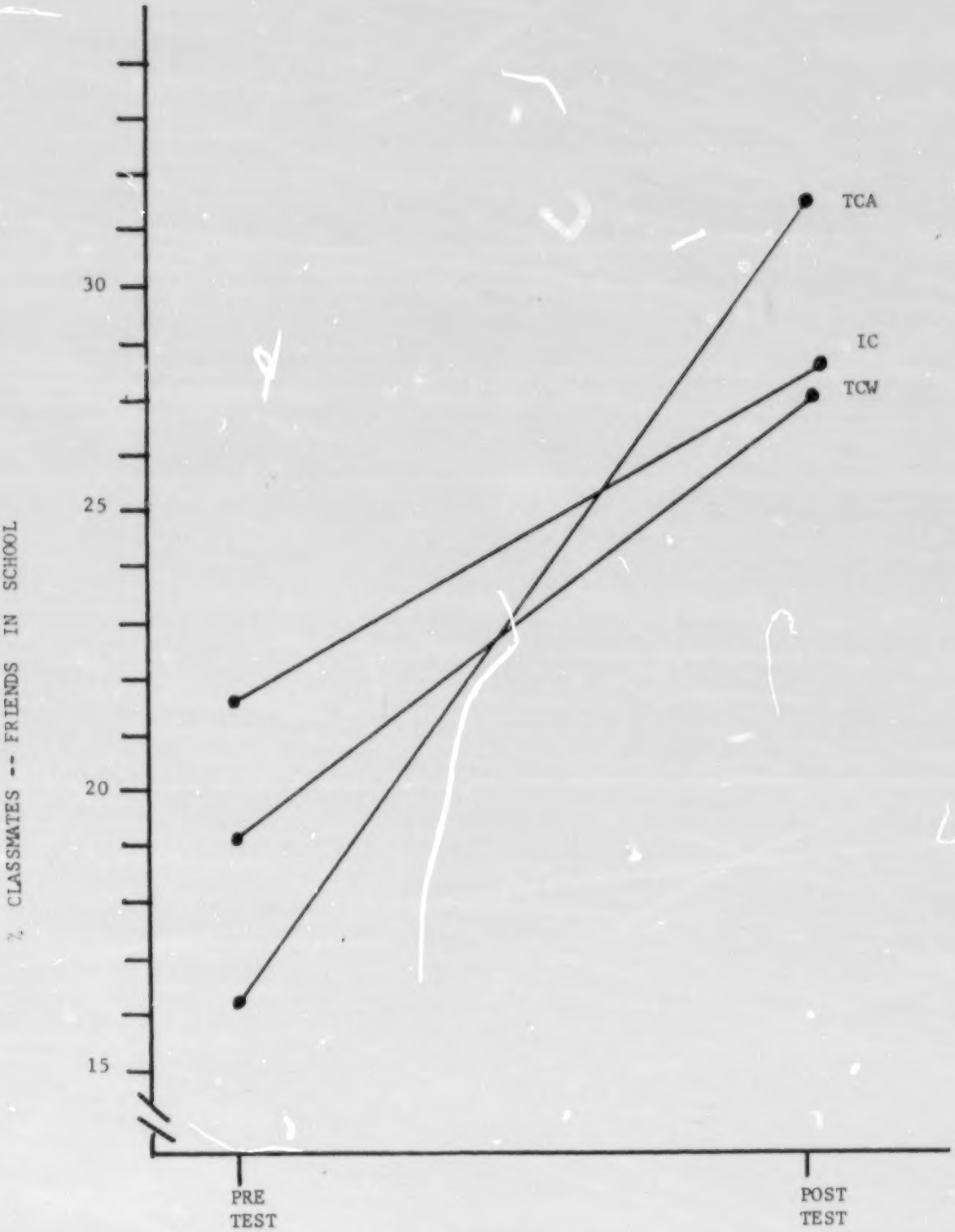

Figure 4--Friends in School for Three Treatment Groups

Note: The scores plotted are arc-sine transformations

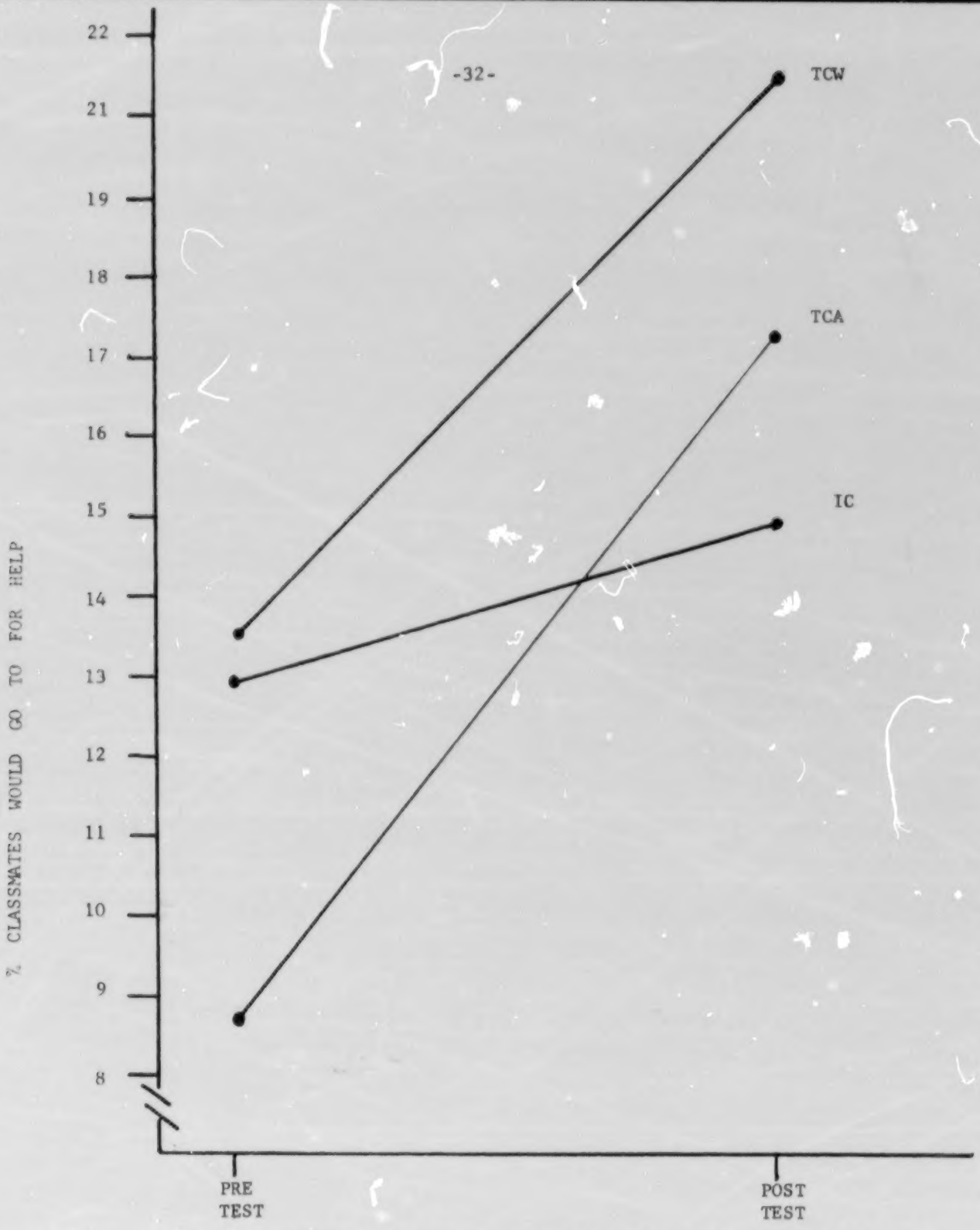

Figure 5--Classmates Would Go To for Help for Three Treatment Groups

Note: The scores plotted are arc-sine transformations

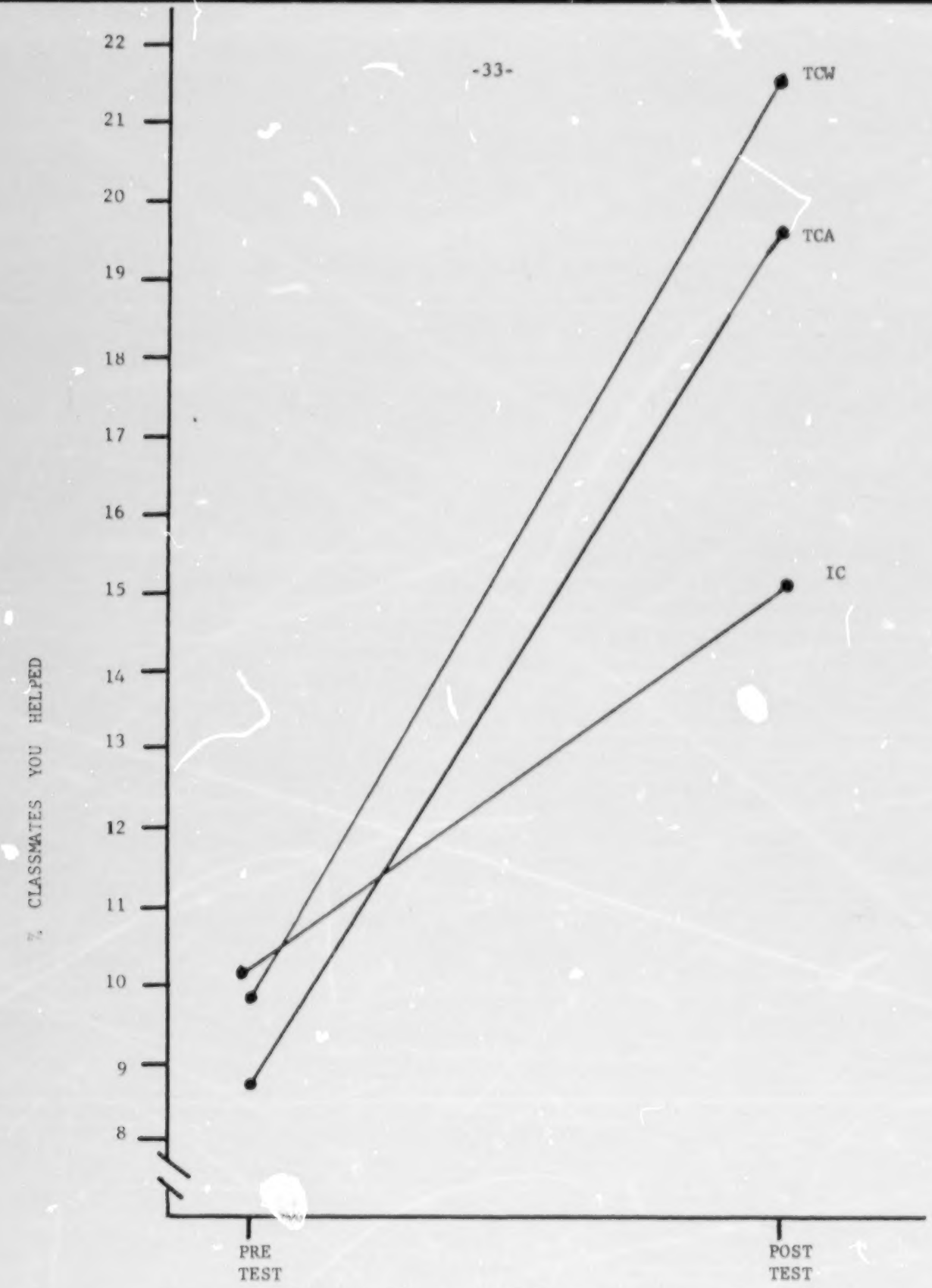

Figure 6--Classmates "You Helped" for three Treatment Groups

Note: The scores plotted are arc-sine transformations

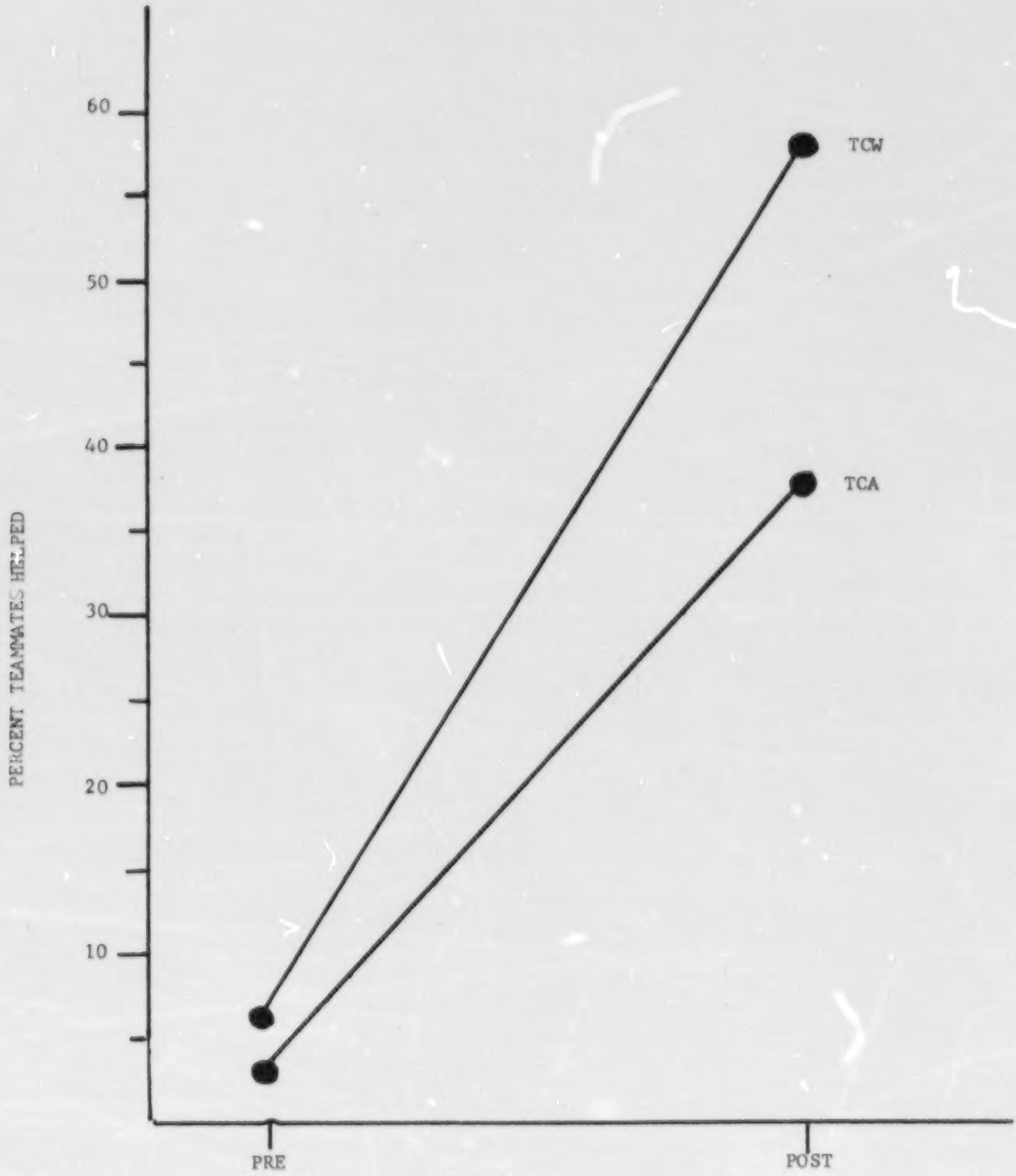

Figure 7: Team Helping
For Two Team Competition Treatments

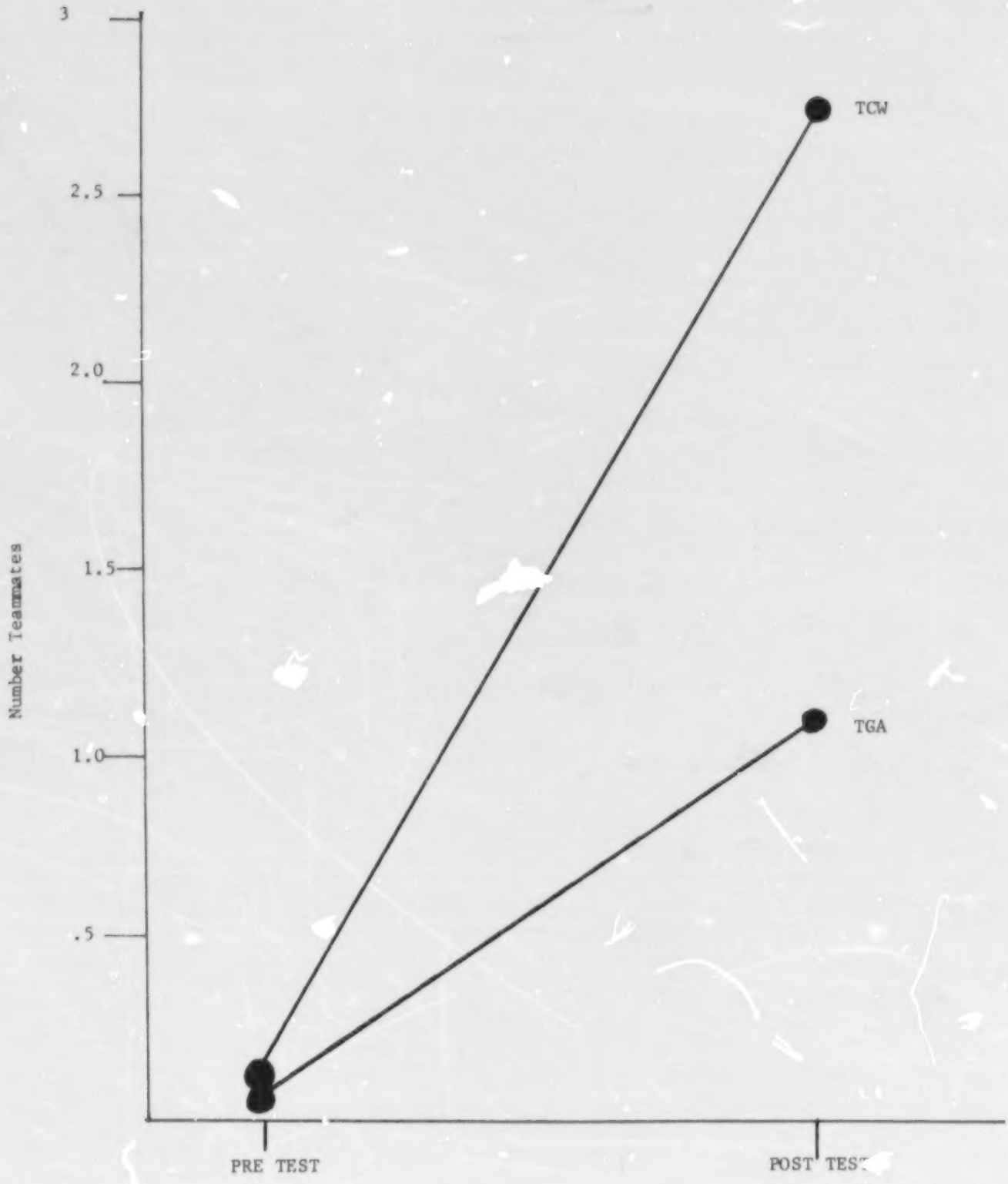

Figure 8: Number Teammates Who Helped Low Performers For Two Team Competition Treatment Groups

Table 1

Summary of Results for Overall Tests of Treatment Effects

	Dependent Variable	Treatment (B)	Teacher (A)	A X B	Treatment Group Ranking IC	TCA	TCW
INDIVIDUAL ANALYSIS	TASK AREA						
	BEHAVIOR						
	1. Peer-Task-Post	.01	.01	.05	3	1.5	1.5
	2. % You Helped-Post	.01	.01	--	3	1.5	1.5
	EXPECTATIONS						
	3. Classmate Expectations-Mid	.01	.01	--	3	1.5	1.5
	Classmate Expectations-Post	.01	--	--	3	1.5	1.5
	4. Competition-Mid	.01	--	.05	3	1.5	1.5
	Competition-Post		--	.05	-	-	-
	5. % Would Go to for Help-Post	.01	--	--	3	1.5	1.5
	SOCIAL-EMOTIONAL AREA						
	BEHAVIOR						
	6. % Friends in School-Post	.01	.05	.01	2.5	1	2.5
	7. % Friends out School-Post	--	--	.01	-	-	-
	EXPECTATIONS						
	8. Mutual Concern-Mid	.01	.05	.01	3	1.5	1.5
	Mutual Concern-Post	.01	--	.01	3	1.5	1.5
TEAM ANALYSIS	1. TEAM FRIENDSHIP RATIO		--	--	-	-	-
	2. TEAM HELPING RATIO	.05	--	--	-	2	1
	3. TEAM TASK ORIENTATION	.05	--	--	-	2	1

Table 2

Regression Analysis of Three Process Variables

DEPENDENT VARIABLE	SOURCE OF VARIANCE	df_1	MIDTEST R^2_I	MIDTEST F-Ratio[1]	POSTTEST R^2_I	POSTTEST F-Ratio[1]
COMPETITION	Teacher (A)	1	.01	< 1	.00	< 1
	Treatment (B)	2	.09	9.68^{**}	.03	2.77^{*}
	A X B	2	.04	3.68^{*}	.05	4.59^{*}
	Total		.14		.08	
CLASSMATES' EXPECTATIONS	Teacher (A)	1	.03	7.51^{**}	.01	1.15^{**}
	Treatment (B)	2	.33	46.24^{**}	.14	15.05^{**}
	A X B	2	.02	2.74	.01	< 1
	Total		.38		.16	
MUTUAL CONCERN	Teacher (A)	1	.02	3.92^{*}	.01	1.42^{**}
	Treatment (B)	2	.20	23.72^{**}	.10	10.44^{**}
	A X B	2	.05	6.26^{**}	.05	5.20^{**}
	Total		.27		.16	

$^{*}p < .05$

$^{**}p < .01$

[1] $df_2 = 179$

Table 3

Cell Means for LEI and Sociometric Data

DEPENDENT VARIABLE	IC		TCA		TCW	
	Teacher One	Teacher Two	Teacher One	Teacher Two	Teacher One	Teacher Two
COMPETITION						
Mid	11.37	10.92	12.18	13.77	12.41	12.38
Post	12.05	11.21	11.97	13.81	12.61	12.46
	(43)	(24)	(34)	(22)	(37)	(24)
CLASSMATES EXPECTATIONS						
Mid	10.50	10.41	12.97	14.86	13.51	14.71
Post	11.40	11.11	13.12	13.73	13.19	14.17
	(42)	(24)	(34)	(22)	(37)	(24)
MUTUAL CONCERN						
Mid	11.49	10.71	12.38	14.09	13.05	14.08
Post	11.88	11.04	12.18	13.91	13.06	13.50
	(43)	(24)	(34)	(22)	(37)	(24)
FRIENDS IN SCHOOL						
Pre	22.83	19.68	16.92	15.00	19.46	18.83
Post	29.90	23.32	27.37	35.43	24.68	30.43
	(41)	(25)	(38)	(23)	(37)	(23)
CLASSMATES WOULD GO TO FOR HELP						
Pre	14.37	13.16	10.87	7.74	15.57	12.74
Post	16.66	14.60	17.27	19.91	20.16	23.57
	(41)	(25)	(38)	(23)	(37)	(23)
CLASSMATES YOU HELPED						
Pre	10.41	10.00	9.39	7.35	10.19	8.91
Post	14.73	15.44	16.29	24.74	20.30	23.48
	(41)	(25)	(38)	(23)	(37)	(23)

( ) = N

Table 4

Regression Analysis of Four Sociometric Items

SOURCE OF VARIANCE		Friends in School		Friends out School		Would go For Help		You Have Helped	
	df_1	R^2_I	F-Ratio[1]	R^2_I	F-Ratio[1]	R^2_I	F-Ratio[1]	R^2_I	F-Ratio[1]
PRETEST (A)	1	.18	50.80**	.36	110.53**	.20	50.72**	.15	41.67**
TEACHER (B)	1	.02	5.64*	.01	3.07	.01	2.53	.06	16.67**
TREATMENT (C)	2	.04	5.64**	.00	< 1	.04	5.07**	.10	13.89**
A X B	1	.02	5.64*	.00	< 1	.00	< 1	.01	2.78
A X C	2	.06	8.47**	.01	1.54	.02	2.53	.01	1.39
B X C	2	.05	7.06**	.05	7.68**	.01	1.27	.02	2.78
A X B X C	2	.00	< 1	.00	< 1	.01	1.27	.01	1.39
TOTAL		.38		.43		.31		.37	

* $P < .05$
** $P < .01$

[1] $df_2 = 175$

Table 5

Multiple Regression Analyses of Team Process Variables

SOURCE OF VARIANCE	df_2[1]	TEAM FRIENDSHIP RATIO R^2_I	F-Ratio[1]	TEAM HELPING RATIO R^2_I	F-Ratio[1]
PRETEST (A)	1	.11	2.36	.00	< 1
TEACHER (B)	1	.02	< 1	.02	< 1
TREATMENT (C)	1	.03	< 1	.29	7.40*
A X B	1	.01	< 1	.01	< 1
A X C	1	.01	< 1	.00	< 1
B X C	1	.05	1.07	.01	< 1
A X B X C	1	.00	< 1	.02	< 1
TOTAL		.23		.35	

*P < .05

[1] $df_2 = 17$

Table 6

Salience of Team in Both Team Competition Conditions for Sociometric Data

DEPENDENT VARIABLE	TCA		TCW	
	PRE	POST	PRE	POST
FRIENDS OUT OF SCHOOL	13% (129)	19% (192)	15% (107)	26% (219)
FRIENDS IN SCHOOL	9% (295)	24% (616)	12% (258)	27% (590)
WOULD GO TO FOR HELP	11% (133)	27% (312)	14% (160)	34% (351)
YOU HELPED	9% (105)	33% (321)	18% (107)	41% (389)

Table 7

Multiple Regression Analysis of Team Interaction Variables

SOURCE OF VARIANCE	df_1	# TEAMMATES HELPED BY R_I^2	# TEAMMATES HELPED BY F-Ratio[1]	# TEAMMATES FRIENDS R_I^2	# TEAMMATES FRIENDS F-Ratio[1]
PRETEST (A)	1	.01	< 1	.11	6.18*
TEACHER (B)	1	.02	1.63	.01	< 1
TREATMENT (C)	1	.31	20.86**	.04	2.13
A X B	1	.00	1.62	.08	4.57*
A X C	1	.02	< 1	.02	1.25
B X C	1	.00	< 1	.01	< 1
A X B X C	1	.00	< 1	.00	< 1
Total		.36		.27	

*P < .05

**P < .01

[1] $df_2 = 42$

Appendix A

Items for Three LEI Types of Self Report Scales

CLASSMATE EXPECTATIONS

(1) Students in this class want me to come to class every day.

(2) My classmates want me to do all my homework.

(3) It does not matter to my classmates if I do badly on a test in this class.

(4) Students in my class do not care if I fail to do the assignments from this class.

(5) My classmates would care if I dropped out of this class.

COMPETITION

(1) I want my work to be better than my friends.

(2) I compete with other students to see who can do the best work.

(3) I always try to do better than the other students in this class.

(4) I feel left out unless I compete with my classmates.

(5) I seldom compete with other students in this class.

MUTUAL CONCERN

(1) If I do not understand an assignment, someone in this class helps me.

(2) I am concerned about the progress of other students in this class.

(3) I do not care if other students skip this class frequently.

(4) My classmates congratulate me if I do well in this class.

(5) I know how well the other students are doing in this class.

Appendix B

Dummy Variable Comparisons of Dependent Variables with Overall Significant Treatment Effects

DEPENDENT VARIABLE	IC vs. TC F-Ratio	TCA vs. TCW F-Ratio
Task Area		
Behavior		
1) # You Helped		
Post	22.94**	2.40
Expectations		
1) Classmate Expectations		
Mid	86.96**	< 1
Post	29.92**	< 1
2) Competition		
Mid	17.98**	1.06
3) # Would Go For Help		
Post	6.40*	< 1
Social-Emotional Area		
Behavior		
1) # Friends in School		
Post	3.71	6.73**
Expectations		
1) Mutual Concern		
Mid	42.64**	1.17
Post	19.01**	< 1

* $P < .05$
** $P < .01$